No. 837,583. PATENTED DEC. 4, 1906.

M. PARIDON.

MATCH MACHINE.

APPLICATION FILED APR. 4, 1906.

5 SHEETS—SHEET 1.

Fig. 10.

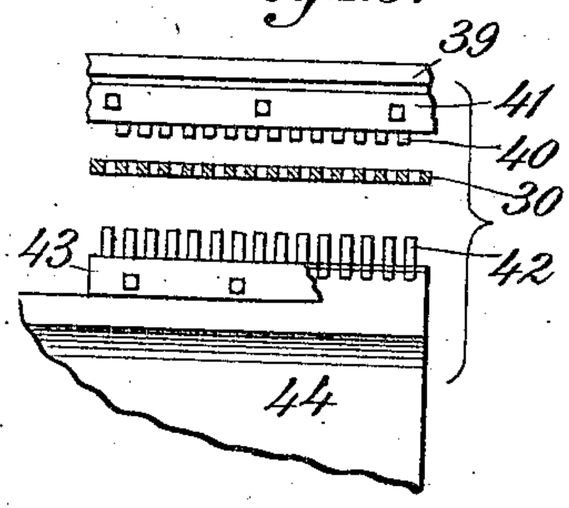


Fig. 11.

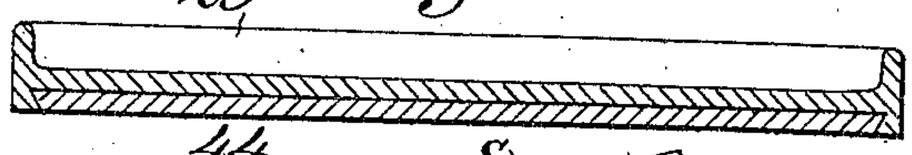
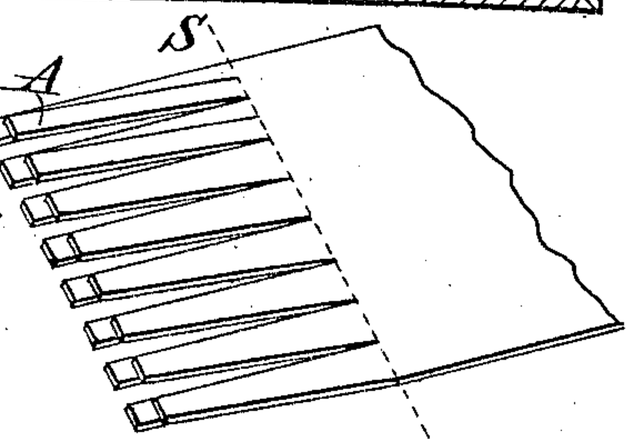


Fig. 12.



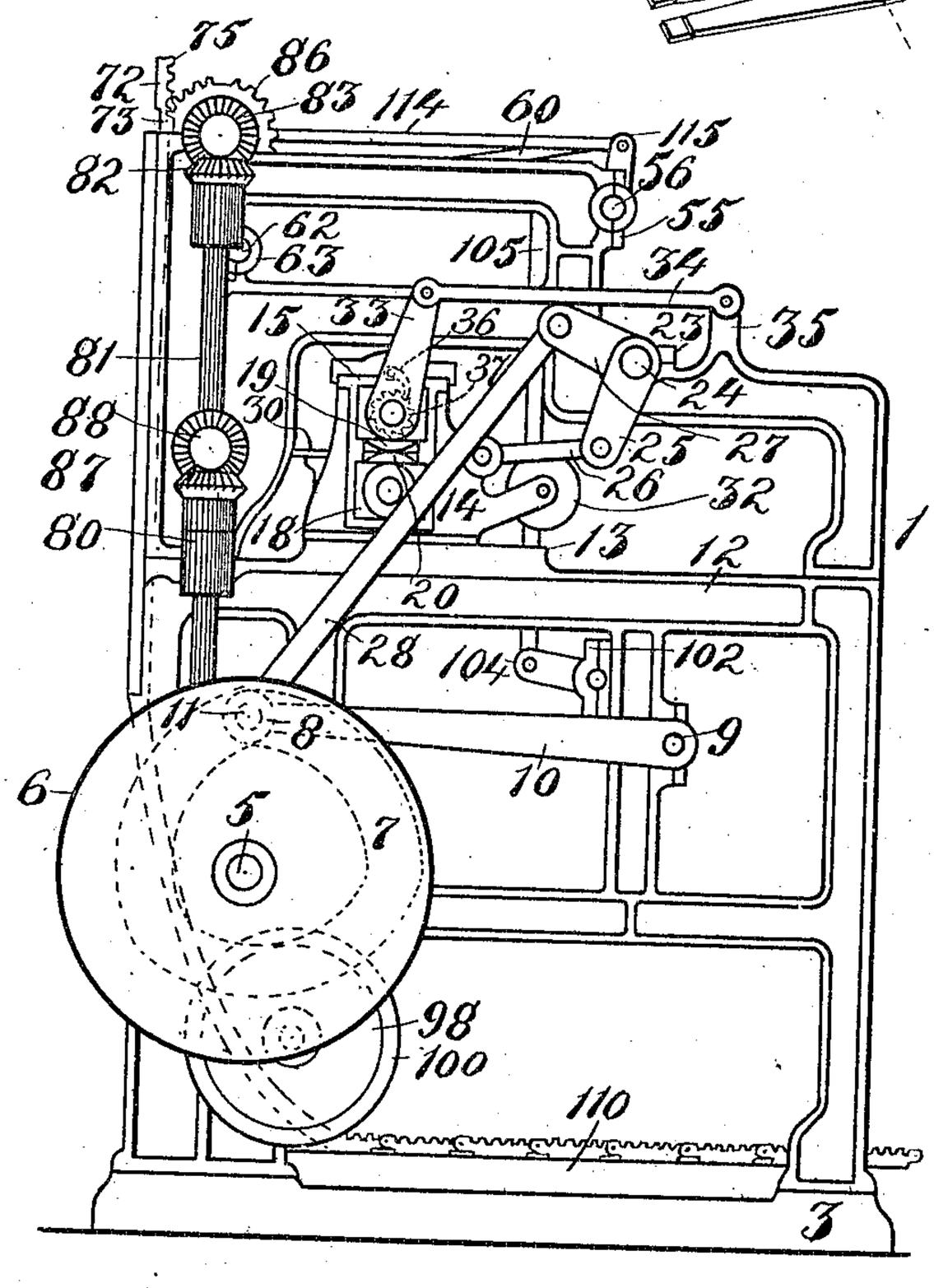


Fig. 1.

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5 SHEETS--SHEET 2.

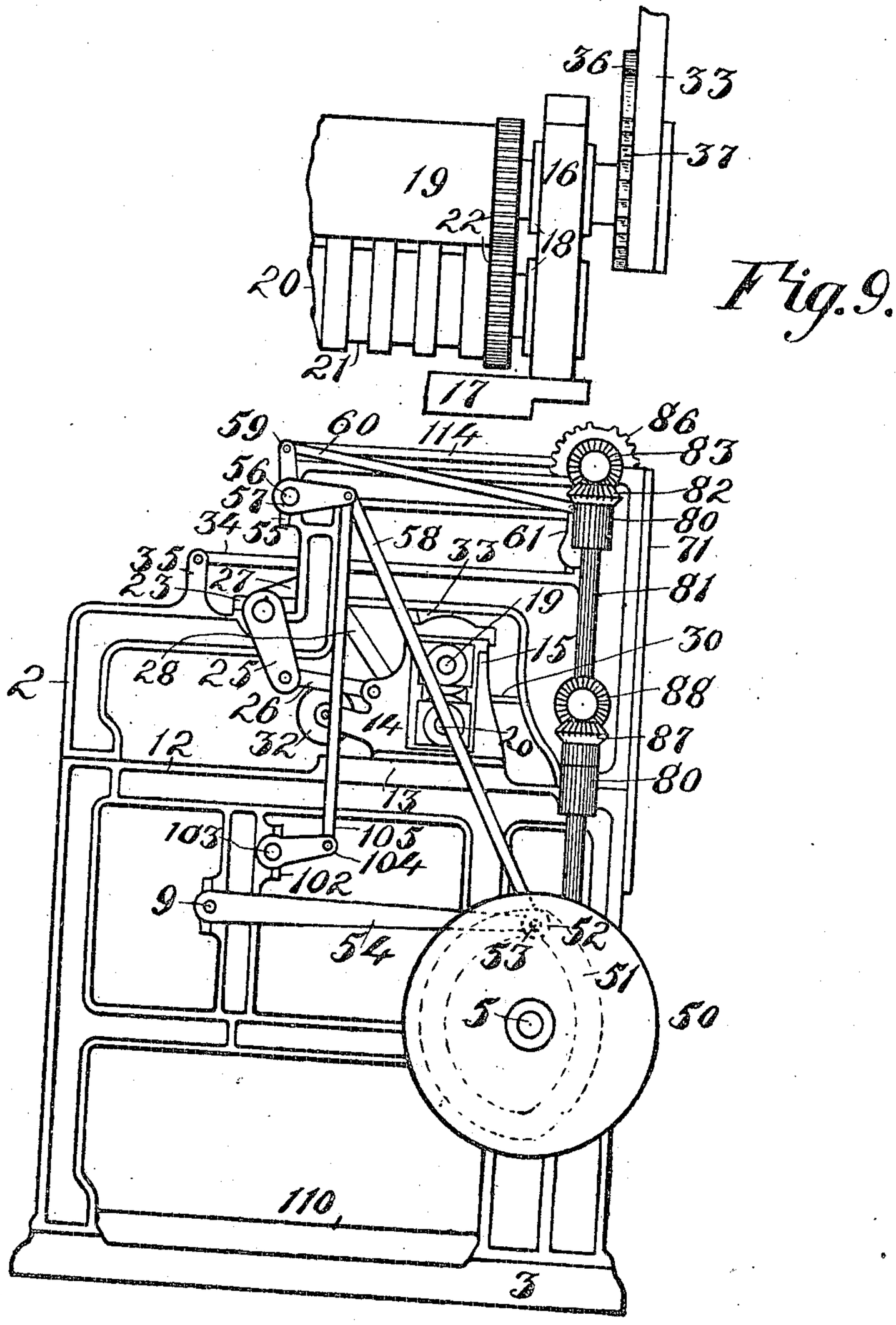

Fig. 9.

Fig. 2.

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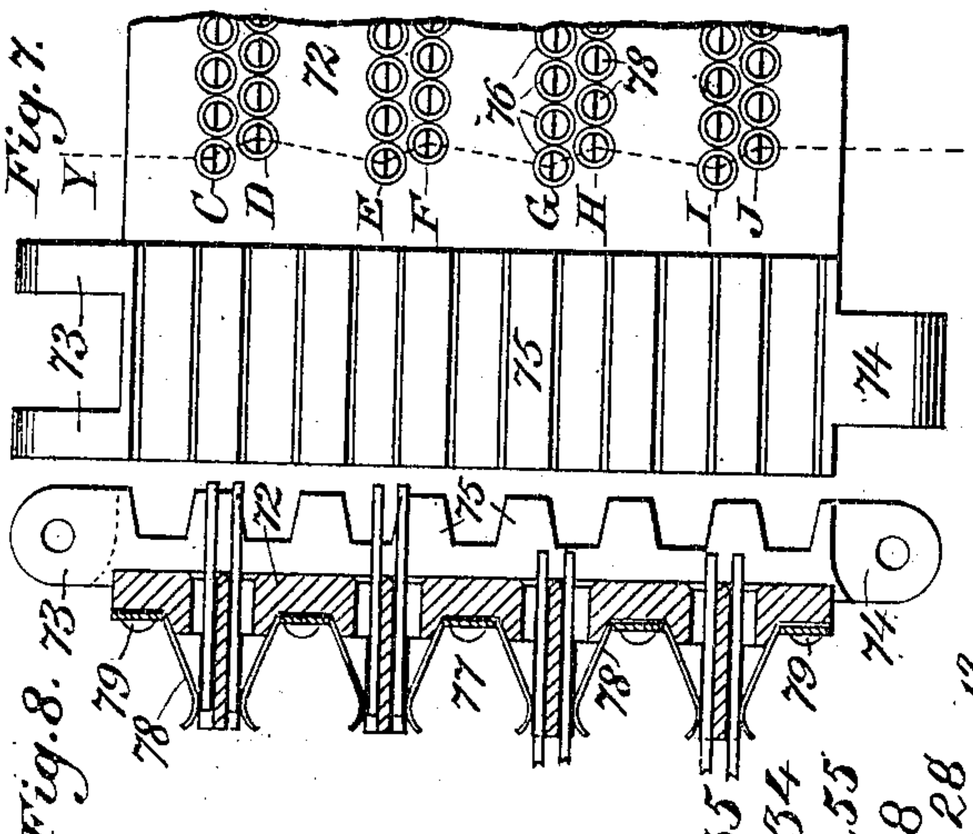
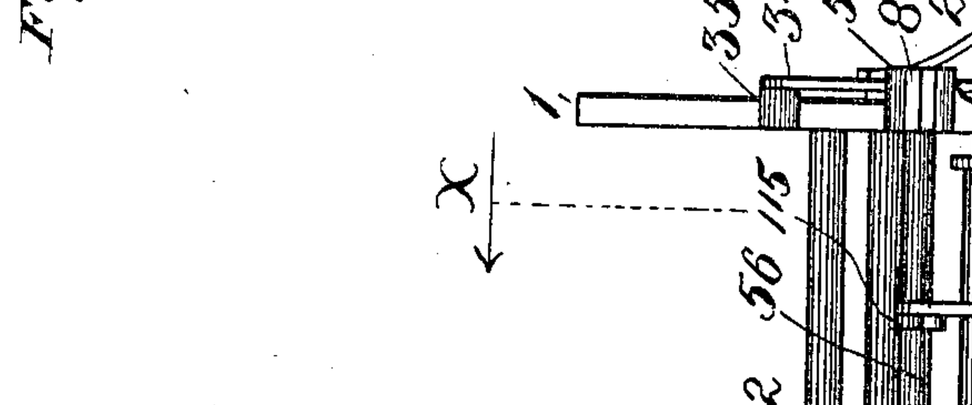
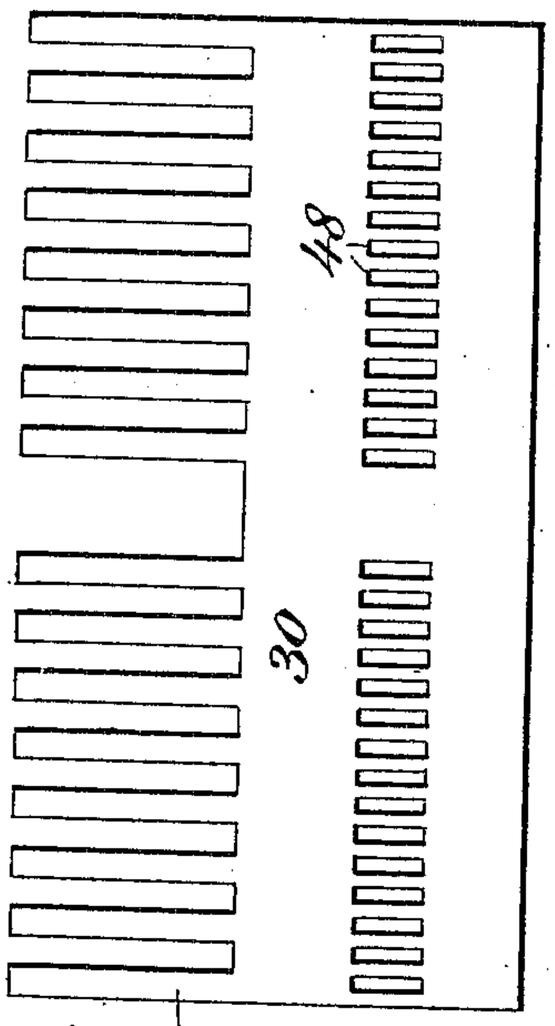
5 SHEETS—SHEET 3.







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MATCH MACHINE.

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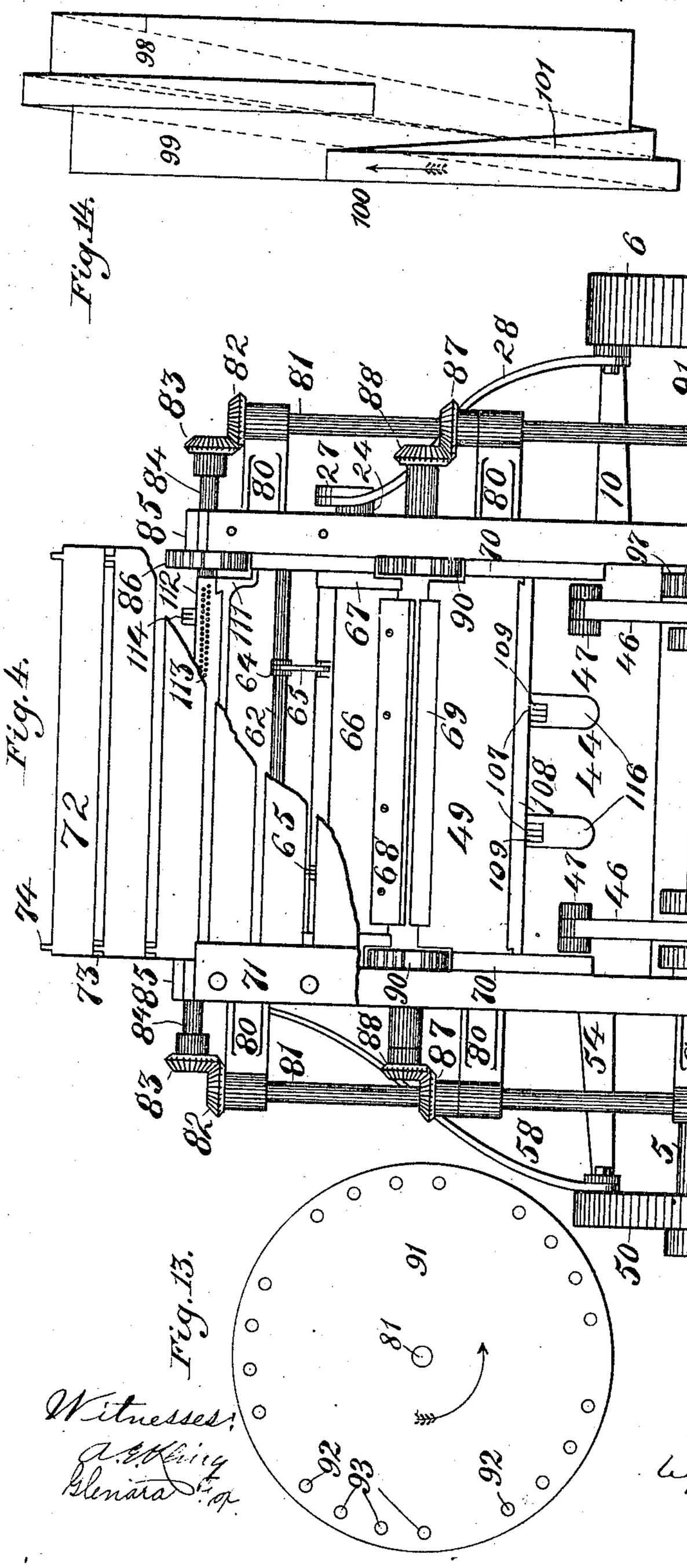
5 SHEETS—SHEET 4.



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MATCH MACHINE.

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6 SHEETS—SHEET 5.

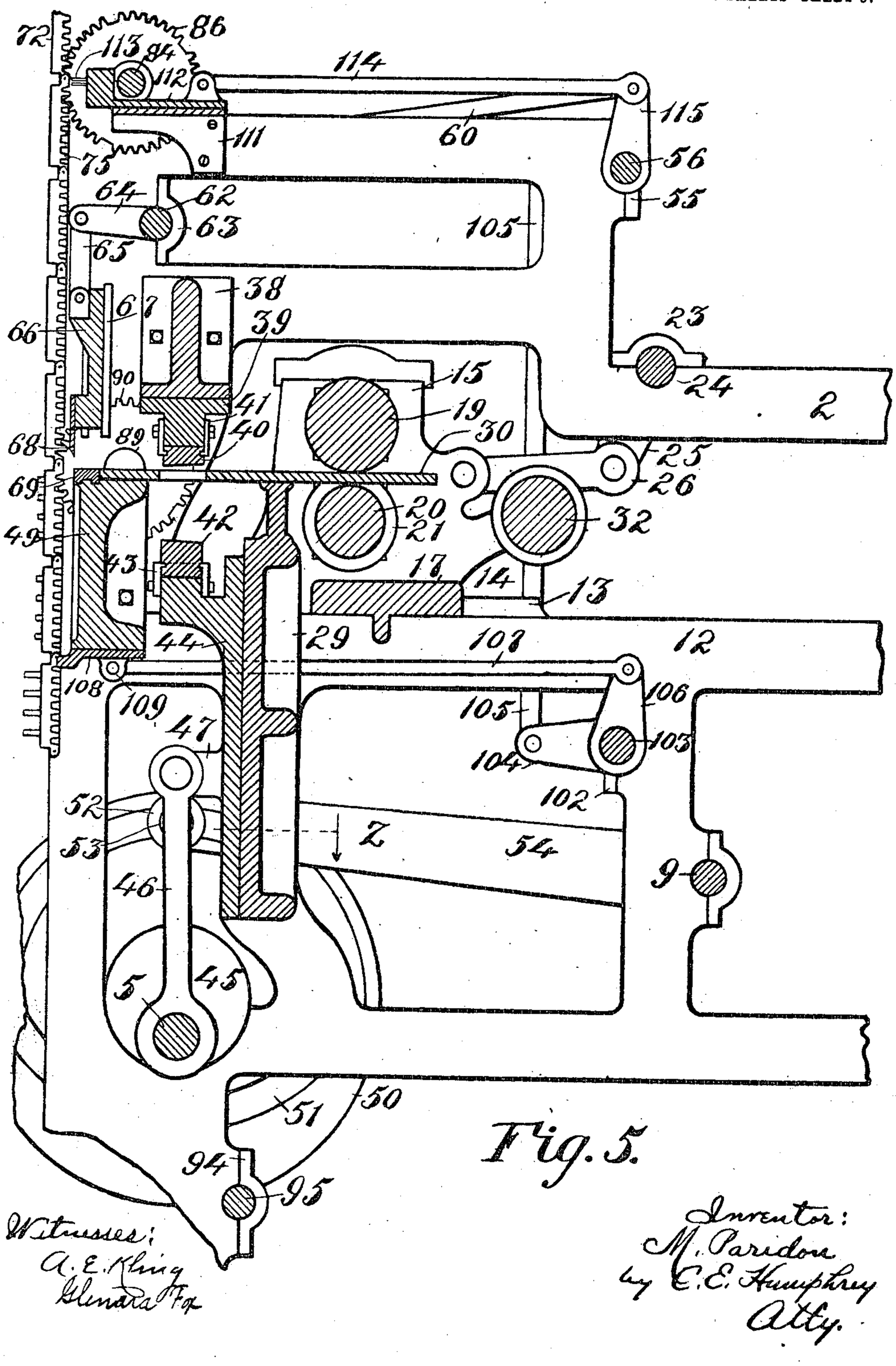

Fig. 5.

Witnesses:
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UNITED STATES PATENT OFFICE.

MICHAEL PARIDON, OF BARBERTON, OHIO.

MATCH-MACHINE.

No. 837,583. Specification of Letters Patent. Patented Dec. 4, 1906.

Application filed April 4, 1906. Serial No. 309,889.

To all whom it may concern:

Be it known that I, MICHAEL PARIDON, a citizen of the United States, residing at Barberton, in the county of Summit and State of Ohio, have invented new and useful Improvements in Match-Machines, of which the following is a specification.

My invention has relation to machines for making paper matches.

The objects of this invention are to produce a machine which will form the matches from a continuous strip of suitable material, as cardboard or pasteboard, sever the individual matches therefrom, place the matches in an intermittingly-moving conveyer-chain by which they are conducted through a dipping and drying process, and subsequently eject them from the chain by mechanism contained within the machine.

The invention aims to produce simple and effective mechanism for accomplishing the before-mentioned results, and, further, aims to produce a new and improved conveyer-chain for the reception of the matches made by the machine which will successfully retain them in proper position while being dipped in an igniting solution, carry them through a drying-room back to the machine, where they are subsequently forced from engagement with the conveyer-chain fully completed and ready for use.

With the foregoing and other objects in view the invention consists of the novel construction, combination, and arrangement of parts constituting the invention to be hereinafter referred to, and illustrated in the accompanying drawings, which form a part of this specification, in which is shown the preferred embodiment of the invention; but it is to be understood that changes, variations, and modifications can be resorted to which come within the scope of the claims hereunto appended.

In the drawings, in which similar reference characters indicate like parts in the different figures, Figure 1 is a side elevation of my improved device. Fig. 2 is a view similar to Fig. 1 from the other side of the machine. Fig. 3 is a plan. Fig. 4 is a front elevation of the machine with portions of the conveyer-chain broken away to better illustrate the mechanism of the device. Fig. 5 is a section of Fig. 3 at the line X. Fig. 6 is a plan view of the stripping-plate. Fig. 7 is a side elevation of one member of the conveyer-chain. Fig. 8 is a section of Fig. 7 at the line Y. Fig. 9 is a detail of the feed-rollers and connected mechanism. Fig. 10 is a detail in front elevation of one of the punches by which the sheet of material is cut into strips to form the match-sticks. Fig. 11 is a horizontal section of certain mechanism shown in Fig. 5 at the line Z. Fig. 12 is a perspective view of a strip of material from which the match-sticks are formed after the operation of forming them has taken place. Fig. 13 is a detail of a pin-wheel used in this device, and Fig. 14 an enlarged view of a worm used.

In the drawings, the reference-numerals 1 and 2 represent open skeleton frames. (Shown in side elevation, respectively, in Figs. 1 and 2.) These two frames are mounted upon a bed-plate 3 and spaced apart from each other a suitable distance, so that the mechanism hereinafter more fully described may be partly contained between them and supported thereby.

Horizontally mounted in journals 4 in the frames 1 and 2 is a main shaft 5, hereinafter designated as the "power-shaft" of the device, and it will be further stated that the side of the device which is shown in Fig. 1 will be hereinafter designated as the "right" side and the side shown in Fig. 2 will be referred to as the "left" side. On the right end of the shaft 5 is mounted a wheel 6, having a suitable outer periphery to receive a belt by which power is communicated to the machine. On the inner face of the wheel 6 is cut a cam-race 7, (shown in dotted lines in Fig. 1,) in which is adapted to run a roller 8, also indicated in dotted lines in Fig. 1.

Mounted between the side frames 1 and 2 is an irrevoluble shaft 9, on the right end of which is pivotally mounted a rocking arm 10, which connects with the axle 11 of the roller 8. This arm 10 is arranged to oscillate as the roller 8 follows the cam-race 7 in the wheel 6 and retain the roller in proper position therein, and aside from this it has no other function.

The central portions of the frames 1 and 2 are provided with oppositely-disposed parallel horizontal integral arms 12, having ways 13, on which are adapted to slide a carriage 14, which supports the feed-rolls. This carriage 14 consists of end housings 15 and a central bracket 16. The central bracket 16 is supported on a cross-bar 17, which extends between the end housings 15 and serves to unite the entire carriage. In the housings

15 are journal-boxes 18, in which are mounted the shafts of parallel rolls 19 and 20, supported centrally by the bracket 16. The lower roll 20 is provided, as shown in Fig. 9, with a plurality of circumferential grooves 21 for a purpose to be stated. The shafts on which the rolls 19 and 20 are mounted bear intermeshing gears 22, which cause a simultaneous motion of both rolls.

The carriage 14 is adapted to be reciprocated along the ways 13 by the following mechanism: Mounted in journal-boxes 23 in the frames 1 and 2 is a rotatable horizontal shaft 24, bearing at both ends fixed arms 25, which are pivotally connected by links 26 with the sides of the carriage 14. The rotation of the shaft 24 is secured in the following manner: On the right end of the shaft 24 is a fixed arm 27, the outer end of which is connected to the axle 11 of the roller 8 by a link 28. From this it will be seen that as the roller 8 follows the course of the race 7 the shaft 24 will be rotated in its bearings by means of the link 28 and arm 27, causing a corresponding movement of the arms 25, and by means of the links 26 will reciprocate the carriage 14 backward and forward along the ways 13.

Extending between the side frames 1 and 2 and supported thereby is a horizontal housing 29. This housing, hereinafter more fully described, forms one of the supports for a stripping-plate 30. (See Fig. 5.) This stripping-plate 30 (best shown in Fig. 6) is a flat sheet of relatively thin metal with its rear portion provided with a series of parallel teeth 31, which are adapted to lie in the grooves 21 in the lower feed-roll 20, and the upper roll is adapted to frictionally engage the upper surface of these teeth, due to the weight of the roll 19, and this may be supplemented, if necessary, by other pressure. The teeth 31 of the plate 30 extend rearwardly from the rolls 19 and 20, and this plate is adapted to form the supporting basis for the material from which the stick portions of the matches are to be made.

Extending between the end housings 15 of the carriage 14 and in the rear of the rolls 19 and 20 is an idler-roll 32, over which the material is carried to the stripping-plate 30.

It will be stated that the stripping-plate 30 is stationary at all times and that material in strips fed thereover is arranged to be progressively moved forward past the toothed portion thereof toward the front end by means of the rotation of the rolls 19 and 20, and in order to do this the rolls 19 and 20 must be rotatable when the carriage 14 is moved to the left in Fig. 5 and must be stationary when the carriage is moved to the right in order that the material on the stripping-plate 30 may be carried backward a short distance by these rolls and again fed forward at each successive reciprocation of the carriage. This is accomplished by the following mechanism: On the right end of the shaft of the roll 19 is freely pivoted an arm 33. (See Figs. 1 and 9.) The outer end of this arm 33 is connected, by means of a link 34, with a post 35 on the frame 1. On this arm 33 is a pawl 36, arranged to engage a ratchet 37, tight on the shaft of the roll 19. The arrangement of this pawl is such that as the carriage 14 moves to the left in Figs. 1 and 5 it will engage the ratchet-teeth 37 and cause a rotation of the rolls 19 and 20, connected by the intermeshing gears 22, so that they will engage the strip of material held between them and move it forward over the upper surface of the stripping-plate 30, and as the carriage 14 reciprocates to the right in Figs. 1 and 5 the pawl 36 rides over the teeth 37, and the rolls 19 and 20 hold the strip by frictional engagement, thus drawing backward the strip of material lying between them a short distance. This reciprocal movement of the carriage 14 is adapted to take place at each revolution of the wheel 6, and beyond the fact of receiving power from a belt this wheel 6 has no other function than reciprocating the feed-carriage 14 backward and forward.

Reference is here directed to Fig. 5. Extending between the side frames 1 and 2 is a bar 38, having attached to its lower face an inverted-**T**-shaped housing 39, with a transversely-grooved lower face, and in these grooves are mounted a plurality of vertical blades 40, held in position by side clamps 41, which have inturned ends which engage in corresponding notches in the sides of these blades. The lower faces of the blades 40 are slightly inclined and stand immediately above the stripping-plate 30. Immediately below the plate 30 are a plurality of similar blades 42, held by clamps 43 in a plunger 44, adapted to reciprocate vertically in dovetail ways in the housing 29.

The peculiar manner of holding the blades 40 in the housing 39 is identically the same as the manner of holding the blades 42 on the plunger 44 and is best shown in Fig. 10. The upper face of the plunger 44 is provided with a series of parallel transverse grooves cut into the material thereof, and into these grooves are set the blades 42. The edges of these blades 42 are grooved, as is also the material which remains between the blades, so that the inturned edge of the clamps 43 will engage therein and retain the blades 42 from displacement. This arrangement also serves to space the blades 42 apart exactly the proper distance from each other, the spaces intervening between them being approximately equal to the thickness of the blades themselves.

The cross-sectional configuration of the housing 29 and plunger 44 is illustrated best in Fig. 11.

The reciprocation of the plunger 44 is secured in the following manner: On the power-shaft 5 between the frames 1 and 2 are a pair of cranks 45, (see Fig. 4,) and to these cranks 45 are attached connecting-rods 46, which are pivotally united to suitably-placed ears 47 on the front face of the plunger 44, so that as the shaft 5 is rotated the plunger 44 will make one complete movement for each rotation thereof.

The blades 42 are adapted to pass through a series of parallel slots 48 in the stripping-plate 30, and the blades 40 on the housing 39 are adapted to alternate in position with respect to the positions of the blades 42, so that they will stand immediately above those portions of the stripping-plate which separate the slots 48.

As the blades 42 pass upward through the slots 48 they will alternate with the blades 40 and constitute a series of shears, so that the strip of material on the stripping-plate 30 will be cut longitudinally, as shown in Fig. 12. The throw of the cranks 45, in connection with the peculiar conformation of the cutting or working edges of the blades 40 and 42, is such that the advanced end of the material is cut into a series of parallel strips, leaving the rear ends of the individual strips attached to the main body of the material from which they are formed.

At the time the shearing action of the blades 40 and 42 is taking place the strips of material which are cut out by the blades 42 are driven upward into an inclined position, (see Fig. 12,) in which these strips are designated by the reference-letter A, and those which are held against movement by contact with the blades 40 are designated by the reference-letter B. The position of the blades 40 is so close to the upper surface of the stripping-plate 30 that the individual strips B are held in substantial alinement with the balance of the material from which they are formed, while those driven upwardly and cut from this material by the blades 42 are forced upward into the position indicated by the reference-letter A in Fig. 12. As the blades 42 start downward from engagement with the blades 40 the edges of the slots 48 retain the strips of material from being carried downward, due to any frictional engagement between the material and the blades 42, and serve as a stripping-plate therefor.

Extending between and supported by the side frames 1 and 2 is a horizontal cross-bar 49. This cross-bar 49 is so placed as to support the front end of the stripping-plate in advance of the slots 48. This bar 49 also has other mechanism connected with it to be described later.

On the left end of the power-shaft 5 is a wheel 50, having in its inner face a cam-race 51, in which is adapted to run a roller 52, provided with a pin 53, to which is pivotally attached a rocking arm 54, loosely mounted on the left end of the shaft 9. The function of the arm 54 is exactly the same with respect to the roller 52 as the arm 10 is with respect to the roller 8. Extending between the side frames 1 and 2 and mounted in bearings 55 is a rotatable shaft 56, which is connected by means of a link 58 to the pin 53 of the roller 52, so that as the roller 52 follows the race 51 the shaft 56 will be rotated in its bearings. Mounted on the left end of the shaft 56 and preferably inside of the rocking arm 57 is another rocking arm 59, to which is connected a link 60, the opposite end of which is connected to a rocking arm 61, mounted on the left end of a shaft 62, rotatable in bearings 63 in the side frames 1 and 2. On this shaft 62 between the frames 1 and 2 are a pair of rocking arms 64, having connected to their outer ends depending links 65. The lower ends of these links 65 are pivotally attached to ears on a vertical frame 66, reciprocally movable between suitable guides 67 on the inner faces of the frames 1 and 2. The lower front edge of the frame 66 bears a knife 68. The upper front edge of the cross-bar 49 is provided with a strip of steel 69, so formed and placed that it will form the support for material lying thereon at the time that the knife 68 is vertically reciprocated by the movement of the mechanism hereinbefore described. The action of this knife 68 will be more fully described in the detailed description of the operation of the entire machine.

Referring now particularly to Figs. 3 and 4, it will be seen that the front faces of the side frames 1 and 2 are substantially vertical and parallel with each other and are provided on their inner oppositely-disposed edges with parallel rabbets 70, and in these rabbets the conveyer-chain for receiving the matches is adapted to travel. These rabbets are converted into grooves by top plates 71, so that the chain in its movement along these rabbets is held from displacement. The portions of the front faces of the frames 1 and 2 which contain the rabbets 70 only extend downwardly from the tops of the frames to a point a little over half of the distance to the bed-plate 3 and from there are cut out sufficiently to permit the chain to pass between them. The conveyer-chain, which is to travel in these rabbets, will be first described before the mechanism for actuating it is taken up. This conveyer-chain (see Figs. 7 and 8) is made up of a series of links or members 72 of sufficient length to extend between the rabbets 70, cut in the faces of the side frames 1 and 2, and is slidable therein. These links or members 72 are preferably provided on one edge with perforated ears 73, which are adapted to pivotally connect with tongues 74 on the edges of adjoining members. Between the ears 73 and tongue 74 in each link are cut rack-teeth 75, into

which are adapted to mesh gears for propelling the chain, which will be more fully described later. The middle portions of the main body of each of these links 72 are outwardly extending, as shown in Fig. 3, and in this portion of the link is placed the mechanism for receiving and retaining the members during the dipping and drying process. Those portions of these links which contain the ears 73, tongues 74, and teeth 75 are adapted to slide in the rabbets 70 and to be there retained by the top plates 71. Through the main body portion of these links 72, between those portions which contain the rack-teeth, are four sets of openings 76, with their inner faces slightly countersunk or rounded. Each of these sets consists of two rows of holes, one row thereof above the other, and the holes in one row alternating in position with respect to the position of the holes in the other row. These sets of holes are designated in the drawings as follows: The upper row of the first set is designated by the reference-letter C and the lower row of holes in this set by the reference-letter D, the upper row in the second set being designated by the reference-letter E and the lower row by the reference-letter F. The upper row in the third set is referred to by the reference-letter G and the lower one by the reference-letter H, the upper row in the fourth set by the reference-letter I and the lower one by the reference-letter J.

The rear faces of the links 72 are provided longitudinally with grooves 77. These grooves are of a width equal to the distance between the centers of the holes in adjoining rows of adjacent sets, and the top and bottom rear faces of these links 72 are rabbeted, as shown in Fig. 8, to the centers of the rows of holes C and J. These grooves 77 and the rabbets just referred to are cut through a portion of the metal constituting the main portion of these links; but enough of the metal is left to leave a portion of the holes 76 uncut thereby.

The metal existing between the rows of holes in each set is of full width and uncut by the grooves 77 or the rabbets just described. Between each set of holes and fastened in the bottoms of the grooves 77 and in the rabbets cut in the top and bottom edges of the links 72 are springs 78, held in position by screws 79. These springs extend outwardly and press against the sides of these grooves 77, and thus close one-half of the transverse area of the openings 76. These springs 78 are adapted to frictionally engage the match-sticks which are driven into the openings 76 and retain them properly in position therein, it being understood that the thickness of the material of which the match-sticks are made will be sufficient for this purpose.

The mechanism by which the conveyer-chain is caused to move intermittingly is as follows: Projecting from the outside faces of the side frames 1 and 2 are a series of brackets 80, in which are mounted two vertically-parallel rotatable shafts 81. These shafts bear at their upper ends miter-gears 82, which mesh into miter-gears 83, mounted on a shaft 84, journaled in boxes 85 on the top faces of the side frames 1 and 2. This shaft 84 is provided inside of the side frames 1 and 2 with spur-gears 86. The shafts 81 also bear intermediate miter-gears 87, which mesh into miter-gears 88, mounted on shafts 89, (see Fig. 5,) and they also bear on their inner ends inside of the frames 1 and 2 spur-gears 90. The gears 86 and 90 are in vertical alinement with each other and are of such a size as to project into the rabbeted portions 70 of the front faces of the side frames 1 and 2, which are cut away for this purpose. The gears 86 and 90 are arranged to mesh with the rack-teeth 75 on the sides of the members 72 of the conveyer-chain during the time that they are passing through the grooves formed by the rabbets 70 and the top plates 71, causing a progressive movement of the chain past the mechanism by which the matches are inserted in the openings 76 thereof.

It will be noted that the ears 73 and tongues 74 of the link 72 of the chain are in direct alinement with the rack-teeth 75 and are of such a thickness as to extend to a line drawn along the top of these teeth, and hence if the gears 86 and 90 are perfect the teeth thereof would encounter these ears 73 and tongues 74 and prevent the operation of the device. For this reason the gears are made of sufficient size to properly support forty teeth; but in the manufacture thereof every eighth tooth is omitted, and the gears 86 and 90 and teeth 75 are so placed in relation to each other that every seven teeth on the faces of the gears will enter the spaces between the teeth 75, and the spaces where the teeth are removed from the gears will occur at the intervals when the ears 73 and tongues 74 are passing the gears 86 and 90.

It will be seen that there are exactly seven recesses between the rack-teeth 75 on each of the links 72, and the distance between the last recess along the pitch-line of these teeth and the centers of the ears 73 and tongues 74 is exactly the distance between the centers of the teeth themselves, so that the gears 86 and 90 are therefore divided into five sets of seven teeth each, and during every complete revolution of the gears 86 and 90 the teeth thereon will engage the rack-teeth of five successive links.

It will be noted that each link 72 is provided with four sets of openings 76, designed for the reception of the match-sticks, and in order to properly place them therein these

sets must be brought into accurate alinement with the match-stick-placing mechanism of the device.

In view of the fact that the match-stick-placing mechanism operates at distinct intervals and the members 72 of the chain are separated from each other, so that the sets of openings 76 along the edges of each member are spaced apart from corrresponding ones on the next member a greater distance than the sets are spaced apart from each other on the individual members, it is necessary to provide means which will at certain intervals move the conveyer-chain a distance equal to twice that between the sets of openings of each individual link. In order to accomplish this, the following mechanism is employed, which is best illustrated in Figs. 4, 13, and 14. On the lower end of the right shaft 81 is a circular disk 91, bearing depending pins into which a worm is adapted to engage and which will be described later. As has already been described, there are four sets of openings 76 in each of the links 72, and as the space intervening between adjoining sets on successive links is equal to double that of adjoining sets on individual links the disk 91 must be caused to make four relatively short movements to bring the openings 76 into successive operative engagement with the placing mechanism and then make such a movement as will bring the first set of openings in the next succeeding link into proper position. In other words, the disk 91 must make four short movements and then a fifth movement equal to twice the length of one of the short movements. In order to accomplish this result, I divide a circle on the under face of the disk 91 into twenty-five equal parts and then place five sets of four pins each in said plate, the sets being so placed with respect to each other that an interval occurs between them equal to double the distance between the members of each set. One of the pins of each set adjoining the spaces hereinbefore referred to is made longer than the three other pins in the set, and in the drawings the long pins are indicated by the reference-numeral 92 and the short pins by the reference-numeral 93. Mounted in bearings 94 in the side frames 1 and 2 is a rotatable shaft 95. This shaft 95 bears a spur-gear 96, which meshes into a spur-gear 97 on the main power-shaft 5, so that a simultaneous rotation of these two shafts is secured whenever motive power is applied to the wheel 6. On the right end of the shaft 95 is mounted a worm 98. This worm is best shown in Figs. 4 and 14 and consists of a body portion 99, on which is a spirally-arranged ridge 100, the inclination of which is equal to the distance between the centers of the pins of each set on the disk wheel 91. The worm 98 is so placed with respect to the disk wheel 91 as to be capable of engaging the pins thereon. The center of the shaft 95 is so placed that the spiral ridge 100 will engage each and every pin 93 on the disk 91 and revolve it a part of a revolution at each rotation of the worm 98. This movement of the disk 91 will bring the four successive sets of openings in each link 72 into operative position with respect to the placing mechanism; but it will be apparent that as soon as the worm has made its fourth revolution unless other mechanism is employed it will enter the space between the sets of pins on the disk wheel 91 and fail to move it, and as this would take place at the time that the openings between the members 72 of the chain are in front of the match-stick-placing mechanism it is necessary to revolve the disk wheel 91 sufficiently to cause the spiral ridge 100 to engage the first pin in the next set after the space intervening between the sets is passed. In order to accomplish this, I make use of the long pins 92, which form the end pins of each successive set, and I form on the worm 98 an additional ridge 101 of such a diameter that the pins 93 are too short to reach it. The pins 92, however, being longer than the pins 93 extend downwardly sufficiently to engage this additional ridge 101 and are moved by it in identically the same manner that the pins 93 are moved by the ridge 100. This ridge 101, as seen by reference to Fig. 14, has an inclination exactly double that of the ridge 100, so that when the pins 92 encounter the ridge 101 the disk 91 is caused to move a distance equal to twice the distance it is moved when the pins 93 are in operative engagement with the ridge 100, and thus the links 72 of the conveyer-chain are moved a double distance at every fifth revolution of the worm-wheel 98. This moving of the links 72 of the conveyer-chain a double distance at every fifth revolution causes the first set of openings in the next succeeding link to be brought into operative position with respect to the match-stick-placing mechanism, and after the matches are placed in this row of openings 76 the worm 98 will cause three successive short movements of the conveyer-chain, which is immediately followed by another long movement. This of course is kept up indefinitely as long as power is applied to the device.

A detailed description of the balance of the mechanism contained in this device (not heretofore described) will be given after a description of the operation of the mechanism which has already been detailed.

It will be stated that this device, as illustrated in the drawings, is designed to form matches from two strips of material which are fed to the device in parallel lines, the ne-

cessity for using two strips instead of one broad strip only is due to the center supporting-bracket 16, which supports the rolls 19 and 20 and which offers an obstacle to the passage of a single wide strip; but as the operations upon both strips are simultaneous and identical reference will be made only to one in the further description of this machine. Attention is first directed to Fig 5. A strip of suitable material, such as cardboard or pasteboard, of an indefinite length is carried over the idler-roll 32 and placed between the rolls 19 and 20 on the stripping-plate 30 at the time that these rolls 19 and 20 are at the right end of their stroke. The advanced end of this strip of material is placed in such a position that its front end is approximately in alinement with the left edges of the blades 40 and 42. The blades 40 and 42, which in coöperation with each other form a punch, are then actuated by the mechanism hereinbefore described, cutting the material into the condition shown in Fig. 12. As soon as the operation of the blades 40 and 42 has taken place the carriage 14 moves to the left, which forces the punched ends of the material forward over the steel plate 69 and into one set of openings in the conveyer-chain. When the carriage 14 moves to the left, the link 34, anchored to the post 35, produces a partial revolution of the arm 33 to the right, and this movement causes the pawl 36 to engage the ratchet 37, whereby the rolls are rotated sufficiently to feed the material simultaneously progressively forward in addition to its being carried to the left by the sliding of the carriage 14 on the ways 13.

It will be stated that the members of the device are so placed with respect to each other that when the conveyer-chain stops during its progressive movement the lower rows of holes (designated in Fig. 7 by the reference-letters D, F, H, and J) will be brought successively into exact alinement with the upper surface of the stripping-plate and steel plate 69, and as the punched ends of the strip of material are carried forward the unbent sticks (referred to in Fig. 12 by the reference-letter B) are driven directly into one of the rows of openings D, F, H, or J, and the rows of sticks on the strip of material (designated by the reference-letter A in Fig. 12) will enter the corresponding upper row of holes in said set, which are designated in Fig. 7 by the reference-letters C, E, G, and I, so that one complete set of holes—consisting of, for instance, rows I and J—will be filled at one movement forward of the strip of material. This is aided by the rounded front ends of the openings 76 and the upwardly-inclined position of the strips designated by the reference-letter A in Fig. 12.

It will be noted that the openings 76 of each set in the members 72 of the chain alternate in position with respect to each other, and this is also true of the ends of the strips A and B on the advanced end of the strip of material from which the matches are formed.

The movement of the carriage 14 and the feed of the rolls 19 and 20 is exactly the correct length to bring the rear ends of the match-sticks formed on the strip of material into exact alinement with the front edge of the steel plate 69 and the cutting edge of the knife 68.

As soon as the match-sticks have been placed in the openings 76 in the conveyer-chain the knife 68 descends, cutting the punched-out ends A and B free from the balance of the material from which they are formed at the point indicated by dotted line S in Fig. 12. As soon as the knife 68 has completed its cut the carriage 14 is reciprocated to the right, which brings back the strip of material into such a position that its front end is in exact alinement with the left edges of the blades 40 and 42, and the operation which has heretofore been described is repeated. When the carriage 14 moves to the right, as just described, the pawl 36 rides freely over the ratchet 37 and the rolls 19 and 20 will not revolve, but will hold the material tightly by reason of the excessive weight of the roll 19.

It will be noted that the rear ends of the match-sticks severed from the strip of material project rearwardly (that is, to the right in Fig. 5) sufficiently to just touch the left face of the steel plate 69, and as soon as the match-sticks have been placed in position the chain makes one step forward, bringing another line of openings 76 into a position to receive the next series of sticks in the same manner as has been referred to.

The match-stick-placing mechanism which has just been described does not drive the match-sticks far enough into the openings 76 to permit their being properly operated on by the dipping process through which they are passed later, and hence additional mechanism is required to drive these match-sticks into the openings 76 a sufficient distance to cause their rear ends to be nicely flush with the rear face of the conveyer-chain, thus enabling their forward ends, which receive the igniting solution, to project. In order to accomplish the further driving inward of the match-sticks into the openings 76, the following mechanism is employed: Mounted in bearings 102 on the side frames 1 and 2 is a rotatable shaft 103, bearing on its left end a rocking arm 104, which is connected, by means of a link 105, to the rocking arm 57, by which motion is communicated to it. Mounted on this shaft 103 between the frames 1 and 2 are rocking arms 106, only one of which is shown in Fig. 5. To the outer ends

of these arms 106 are pivotally connected links 107. On the under face of the cross-bar 49 are dovetail ways (see Fig. 4) in which are adapted to slide a carriage 108, the front end of which is sufficiently broad to cover one complete set of openings 76. This carriage 108 bears ears 109, to which links 107 are connected. The function of this carriage 108 is to reciprocate in the ways in the cross-bar 49 and to engage the rear ends of the match-sticks and drive them into the openings 76 sufficiently to cause their forward ends to project a proper distance.

The conveyer-chain, made up of the links 72, travels downwardly through the grooves formed by the rabbets 70 and top plates 71 until they pass therefrom by reason of the cut-out portions of the front faces of the side frames 1 and 2 and from thence depend in an easy curve (indicated in dotted lines is Fig. 1) and pass onto shelves 110, extending along the inside faces of the side frames 1 and 2. From thence the chain bearing the match-sticks is carried to any form of dipping device which may be utilized to place an igniting solution on the ends thereof, and after this solution has been placed thereon the carriage may pass through a drying-room to dry this solution; but as the dipping and drying mechanisms form no part of this invention and may be of any common or ordinary construction they are not shown in the drawings, nor will they be described herein; but the mechanism for drying the solution on the match-sticks will preferably be so placed that the conveyer-chain made up of the links 72 will return therefrom over the top of the device (herein shown) and again enter the grooves formed by the rabbets 70 and top plates 71, bearing the completed matches.

In order to eject the matches (now completely formed) from the openings 76 in the members 72, I place at the top of the device (herein shown) an ejector for driving the completed matches from the chain preparatory to the replacing of fresh sticks therein. This ejecting device is as follows, and reference is here directed to Figs. 2, 3, 4, and 5. Extending between the side frames 1 and 2 is a housing 111, having on its upper surface dovetail ways in which is adapted to reciprocate a carriage 112, preferably provided with an upturned face having pins 113 projecting therefrom, so placed with respect to each other that they will enter the openings 76 of the conveyer-links 72 and drive the perfected matches therefrom. This carriage 112 is reciprocated by means of the links 114 attached thereto, which are also pivotally connected to rocking arms 115 on the rotatable shaft 56. The operation of this ejector is such that all the completed matches borne by the conveyer-chain will be forced therefrom before the links reach the point where the match-stick-placing mechanism is located.

What I claim, and desire to secure by Letters Patent, is—

1. In a machine of the class described, the combination with a pair of upright, parallel frames suitably connected together and provided along their middle portions with parallel ways, a carriage slidably mounted on said ways, a housing at each end of said carriage, a pair of rollers mounted in said housings one of which is provided with a plurality of peripheral grooves, a perforated stripping-plate having one end thereof formed with a plurality of teeth corresponding in number and of suitable size to rest in the grooves of said roller, a reciprocating cutter adapted to pass through the openings in said stripping-plate and engage material passed between said rollers, said stripping-plate constituting means for disengaging said material from said cutter, mechanism to reciprocate said carriage on said ways, means for connecting said rollers together so that motion imparted to one is simultaneously transferred to the other and means to impart to said rollers a partial rotation when said carriage is reciprocated in one direction and to be inoperative when the carriage is reciprocated in an opposite direction.

2. The combination in a machine of the class described, of a conveyer-chain, means to cause said conveyer-chain to move intermittingly and progressively through a suitable course in said device, means to insert in said conveyer-chain a plurality of match-splints at each pause in the movement of said chain, said chain being composed of a plurality of members pivotally hinged together, each member being provided with a plurality of series of openings extending therethrough, each series consisting of a pair of rows of openings in parallel lines arranged transversely of said member, the openings in each row being arranged to alternate in position with respect to the corresponding openings in the opposite row of each series, said series being spaced from each other a distance equivalent to the travel of the chain during the movements thereof, each of said members being further provided on the rear faces thereof with a plurality of grooves, said grooves being of a depth approximating one-half the thickness of said members and of such a width as to extend between the centers of adjacent rows of openings in adjacent series and a spring member fixedly secured in the central bottom portion of each of said grooves, said spring members having formed in their edges a plurality of spring-fingers each of which is adapted to close a portion of

an opening and to operatively engage match-splints forced through said openings whereby said match-splints are retained in said openings by frictional engagement with said spring-fingers and the sides of the openings in which they are inserted.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

MICHAEL PARIDON.

Witnesses:
C. E. HUMPHREY,
GLENARA FOX.